Claims

1. An apparatus for measuring, in connection with a printing press, print quality of the printing press used in the production of newspapers, which apparatus is provided with light sources illuminating a moving paper web and with photo detectors measuring the light reflected from the surface of the paper web and sent by the light sources, **characterized** in that the apparatus is arranged to measure, continuously during the running of the printing press and simultaneously substantially across the entire width of the paper web, several parallel reflection profiles that extend in the longitudinal direction substantially over the entire page, and use the measurement results of the measuring apparatus in real time for the detection of waste and for the adjustment of inking in the printing press.

2. An apparatus as claimed in claim 1 for measuring print quality, **characterized** in that the apparatus is arranged to identify the normal operation of the printing press from reflection profiles measured substantially over the entire area of a page, and measure parameters needed in closed-loop control of the printing press only during said normal operation of the printing press, and at other times analyze from the measured reflection profiles only waste parameters, which are used to bring the printing press to normal operation.

3. An apparatus as claimed in claim 1 or 2 for measuring print quality, **characterized** in that the apparatus infers the locations of test marks used for closed-loop control from the measurement results of the reflection profiles substantially covering the entire page.

4. An apparatus as claimed in any one of claims 1 to 3 for measuring print quality, **characterized** in that the light source used for measuring the reflection profile illuminates substantially only the area seen by each detector that measures reflection.

5. An apparatus as claimed in claim 4, **characterized** in that the light source and the photo detector operate as phase-locked.

6. An apparatus as claimed in claim 1 to 3 for measuring print quality, **characterized** in that the apparatus infers the validity of the measurement results for closed-loop control from the measurement results of the reflection profiles substantially covering the entire page.

7. An apparatus as claimed in any one of claims 1 to 4 for measuring print quality, **characterized** in that sampling is more frequent at the test marks than elsewhere.

8. An apparatus as claimed in any one of the preceding claims for measuring print quality, **characterized** in that the light sources used for measuring the reflection profile are LEDs operating at different wavelengths.

9. A method for measuring and monitoring print quality of a printing press used in the production of newspapers based on reflection profile measurements according to claim 1, wherein a moving paper web is illuminated by means of light sources and the light reflected from the surface of the paper web and sent by the light sources is measured by means of photo detectors, **characterized** in that the method determines reference profiles at the beginning of the printing process and measures reflection profiles during production substantially from the entire area of a page, in the longitudinal direction substantially over the entire page and substantially across the entire width of the paper web, the measuring and monitoring of the print quality during production being based on comparing the reflection profiles measured and the reference profiles and on calculating parameters, on the basis of which it is inferred as to when the operation of the printing press is normal, and during said normal operation the darkness of the print is measured from test marks or from another part representing a given

darkness of the print, and inking in the printing press is adjusted based on the result of measurement.

10. A method as claimed in claim 9 for measuring and monitoring print quality based on reflection profiles, **characterized** in that the measurement of the reflection profiles is made as a sampling measurement such that sampling is more frequent at test marks than in the area of the rest of the page.

11. A method as claimed in claim 9 for measuring and monitoring print quality based on reflection profiles, **characterized** in that the reflection profiles are processed in parallel in several modules.

12. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that an accepted page indicated by the printer or inferred by the system or calculated from a pre-press data file is used as reference.

13. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that the cause of a flaw in print quality is inferred based on the measurement data of the reflection profile of a page, i.e. whether a flaw in print quality is caused by water marking, toning, ink blotches or by areas having too little printing ink.

14. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that the results of continuous profile measurement are used for assessing the condition of the printing press.

15. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that from the results of continuous profile measurement it is inferred at the beginning of printing as to when printing plates open and the measuring apparatus starts only after that an automatic search

for test marks and possibly also informs the control and automation system of the printing press about the opening of the printing plates, for example, a device measuring a register difference, so that these can also start measurements and adjustment.

16. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that the results of continuous profile measurement are also used for analyzing failure of the printing press, for example, by means of recurrent darkness variations, among other things, bearing defects of the printing press, wear of a cylinder blanket or depressions in cylinder blankets, uneven wear of printing plates, worn rollers or worn bearer rings are advantageously identified.

17. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that the results of continuous profile measurement are used for analyzing the printing of the test mark and if there are flaws in the printing of the test mark, such as a significant register difference, toning or ink blotches, the colour measurement system warns the printer and/or the automation system of a measurement error and stops closed-loop control of ink feed.

18. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that the results of continuous profile measurement are used for assessing failure of the measuring apparatus (self-testing) by also measuring non-printing areas, so that a permanently reduced contrast between white and black indicates contamination of the measuring apparatus.

19. A method as claimed in any one of the preceding claims for measuring and monitoring print quality, **characterized** in that the results of continuous profile measurement can be used in the calibration of the measuring apparatus such that

the apparatus measures the reflection profile of the entire page, searches for and analyzes test areas and calibrates itself automatically.

20. A method as claimed in anyone of the preceding claims for measuring and monitoring print quality, **characterized** in that the results of continuous profile measurement are used for collecting production data, such as for measuring ink consumption and for analyzing production mode.